**Some easier, some trickier, all missing angles – have a go**

**Q1.**

**Angle *k***

Look at the diagram.

                             

Not drawn accurately

AB is a straight line.

Work out the size of angle *k*

**

*k* =  ...................... °

2 marks

**Q2.**

**Three straight lines**

          The diagram shows three straight lines.



          Work out the sizes of angles *a*, *b* and *c*

          Give reasons for your answers.



*a* = ................° because   ..........................................................................................

                                          ..........................................................................................

                                          ..........................................................................................

1 mark

*b* = ................° because   ..........................................................................................

                                          ..........................................................................................

                                          ..........................................................................................

1 mark

*c* = ................° because    ..........................................................................................

                                          ..........................................................................................

                                          ..........................................................................................

1 mark

**Q3.**

**Angle *p***

          This shape has been made from two congruent **isosceles** triangles.



Not drawn accurately

          What is the size of angle *p*?



*p* = .........................°

2 marks

**Q4.**

**Four angles**

          Look at the diagram, made from four straight lines.

          The lines marked with arrows are parallel.



          Work out the sizes of the angles marked with letters.



*a =* .........................°          *b =* .........................°

*c =* .........................°          *d =* .........................°

3 marks

**Q5.**

**Rhombus**

          The diagram shows a **rhombus**.

          The **midpoints** of two of its sides are joined with a straight line.



          What is the size of angle *p*?



*p* = .............................°

2 marks

**Q6.**

**Parallelogram**

          ABCD is a **parallelogram**.



Not drawn accurately

          Work out the sizes of angles *h* and *j*

        Give reasons for your answers.

  *h* = ...............................°  because ...........................................................................

...........................................................................

...........................................................................

...........................................................................

1 mark

*j* = ...............................°  because ...........................................................................

...........................................................................

...........................................................................

...........................................................................

1 mark

**Q7.**

**Four kites**

          This shape is made of four congruent kites meeting at a point.



          Calculate the size of angle *k*

**

*k =* .........................°

2 marks

**Q8.**

**Angles**

          The diagram shows triangle PQR.



          Work out the sizes of angles *a*, *b* and *c*

**

*a* = ………………°     *b* = ………………°    *c* = ………………°

3 marks

**Q9.**

**Triangles**

          (a)     A triangle has **three equal sides**.

          Write the sizes of the **angles** in this triangle.

  ................°,     ................°,     ................°

1 mark

(b)     A **right-angled triangle** has **two equal sides**.

          Write the sizes of the **angles** in this triangle.

  ................°,     ................°,     ................°

1 mark

**Q10.**

**Triangle**

          Look at the triangle.



          Work out the value of *a*

**

*a =* .........................

3 marks

**Q11.**

**Three angles**

          Three shapes ﬁt together at point B.



          Will ABC make a straight line?

                   Yes         No

          Explain your answer.



1 mark

**Q12.**

**Rectangle rest**

          The diagram shows a **rectangle** that just touches an **equilateral triangle.**

****

(a)     Find the size of the angle marked *x*
Show your working.



.............................°

2 marks

(b)     Now the rectangle just touches the
equilateral triangle so that
**ABC** is a **straight line.**

****

Show that **triangle BDE** is **isosceles**.



2 marks

**Q13.**

**Star**

          The shape below has **3 identical white** tiles and **3 identical grey** tiles.

          The sides of each tile are all the same length.
Opposite sides of each tile are parallel.

          One of the angles is 70**°**

****NOT TO SCALE

(a)     Calculate the size of **angle** ***k***.



angle *k* = ...............................**°**

1 mark

(b)     Calculate the size of **angle** ***m*.**

          Show your working.



angle *m* = ...............................**°**

2 marks

**Q14.**

**Clock**

|  |  |
| --- | --- |
| (a)     The time on this clock is **3 o'clock**.          What is the **size** of the **angle** between the hands?  ..........................° |   |

1 mark

(b)     Use a whole number to complete this sentence:



          At .......................... o'clock the size of the angle between the hands is **180**°

1 mark

(c)     What is the size of the **angle** between the hands at **1 o'clock**?

  ..........................°

1 mark

(d)     What is the size of the **angle** between the hands at **5 o'clock**?

  ..........................°

1 mark

(e)     How long does it take for the **minute** hand to move **360**°?



1 mark

**Q15.**

**Cutting a cake**

          Ben is **10** years old.

          Cindy is **15** years old.

          Tom is **20** years old.

                                                              

          They are going to cut a cake into 3 slices from the centre.

          The size of the slices will be proportional to their ages.

          What will the **angle** at the centre of **Ben’s** slice be?



..................°

2 marks

**Q16.**

(a)     Work out the size of the angle marked *x*



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

         Answer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ degrees

2 marks

(b)     Work out the size of the angle marked *y*



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

         Answer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ degrees

2 marks

**Q17.**

(a)



\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Answer \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

2 marks

(b)     Which of the following describes angle *x* ?

Circle your answer.



1 mark

**Q18.**

Two of the angles in a triangle are 70° and 40°

Jack says,



Explain why Jack is **not** correct.



1 mark

**Q19.**

Layla completes one-and-a-half somersaults in a dive.



How many **degrees** does Layla turn through in her dive?



1 mark

**Q20.**

Calculate the size of angles ***a*** and ***b*** in this diagram.





1 mark



1 mark

Mark schemes

**Q1.**

35

**2**

***or*** Shows the values 50 and 95 or the value 145

or

Shows a complete correct method with not more than one computational error

eg

•        180 – 130 = 50,

          180 – 85 = *105 (error)*,

          180 – 50 – 105 = 25

•        (130 + 85) – 180

**1**

**[2]**

**Q2.**

Gives *a* = 50 and gives a correct reason
eg

•    Angle *a* is on a straight line with 130, so *a* = 180 – 130

•    *a* is supplementary with 130, so *a* + 130 = 180

•    The angle vertically opposite 130 is 130, 360 – (130 + 130) = 100,
(angles at a point) *a* is  = 50 (also vertically opposite)

***Accept: minimally acceptable reason***

*eg*

*•*    *On a straight line*

*•*    *Supplementary*

*•*    *Opposite angles and angles at a point*

***Do not accept: informal reason without the correct
geometrical property identified***

*eg*

*•*    *180 – 130*

*•*    *360 – 260*

*2*

***Do not accept: incomplete reason***

*eg*

*•*    *It is adjacent to the 130° angle*

**U1**

          Gives *b* = 60 and gives a correct reason
eg

•    Angle *b* is vertically opposite the 60° angle, so it is also 60°

•    The angle on a straight line with *b* is 120, so *b* is 360 – 120 – 120 – 60
(angles at a point)

***Accept: minimally acceptable reason***

*eg*

*•*    *Opposite*

*•*    *Angles on a straight line and angles at a point*

***Do not accept: informal reason without the correct geometrical property identified***

*eg*

*•*    *b is equal to the 60° angle next to it*

***Do not accept: incomplete reason***

*eg*

*•*    *It is the same as the 60° angle*

**U1**

          Gives *c* = 70 and gives a correct reason
eg

•    There are 180° in a triangle, so *c* = 180 – 50 – 60

•    The exterior angle of a triangle is equal to the sum of the two opposite
interior angles, so *c* = 130 – 60

***Accept: minimally acceptable reason***

*eg*

*•*    *Angles in a triangle*

*•*    *Exterior angle = sum of two opposite interior angles*

*•*    *We’ve already got 50 and 60 in the triangle*

***!***      ***Follow through***

*Accept as 180 – (their a + b), alongside a correct reason referring to angles in a triangle, or as 130 – their b alongside a correct reason referring to an exterior angle of a triangle*

***Do not accept: informal reason without the correct geometrical property identified***

*eg*

*•*    *180 – (a + b)*

*•*    *130 – b*

***Do not accept: incomplete reason***

*eg*

*•*    *It is in a triangle*

*•*    *All the inside angles add up to 180°*

**U1**

**[3]**

**Q3.**

140

**2**

***or***      Shows the value 110 or 220

          or

          Shows or implies a complete correct method with not more than one
computational error

          eg

•    360 – 2 × (180 – 35 × 2)

•    360 – (360 – 4 × 35)

•    70 × 2

•



•    35 + 35 = *80 (error)*, 180 – 80 = 100
360 – 100 × 2 = 160

**1**

**[2]**

**Q4.**

Gives all four correct angles,
ie

          *a* = 110              *b* = 70
*c =* 50                *d =* 130

**3**

***or***      Gives any three correct angles

          or

          Gives all four values 110, 70, 50 and 130, but in the incorrect order

**2**

***or***      Gives any two correct angles

          or

          Shows three of the angles 110, 70, 50 and 130, but with the links
to each letter incorrect or omitted
or

          Gives four different angles (ie no two of the angles are equal)
that sum to 360

***Accept angles indicated on the diagram***

**1**

(U1)

**[3]**

**Q5.**

145

**2**

***or***      Shows the value 35

or

          Shows a complete correct method with not more than one computational error

eg

•    180 – 110 = 70,

     180 – 70 ÷ 2

•    (540 – 110 – 70 – 70) ÷ 2

•    180 – 110 = 70

     70 ÷ 2 = *25 (error)*

     180 – 25 = 155

**1**

**[2]**

**Q6.**

Gives *h =* 80 and gives a correct reason
eg

•    *h* is an alternate angle with the 80º angle marked

•    The angle on the straight line with *h* is supplementary with
80 so 180 – 80 = 100, then *h =* 180 – 100

•    For the bottom trapezium, *h +* 60 + 120 + 100 = 360,
so *h =* 360 – 280

***Accept minimally acceptable reason****eg*

*•*    *Alternate*

*•*    *Supplementary to 80, on a straight line*

*•*    *Quadrilateral 360 – 280*

***Do not accept informal justification without correct
geometrical property identified****eg*

*•*    *It’s the same as the 80 because of*     *the parallel lines*

*•*    *180 – 100*

*•*    *360 – 280*

***Do not accept incomplete reason****eg*

*•*    *It is the same as the 80º angle marked*

*•*    *Angles in a quadrilateral add up to 360º*

*•*    *It’s opposite the 80º on the other side*

**U1**

          Gives *j =* 120 and gives a correct reason
eg

•    The angle on a straight line with *j* is 60 because it is an alternate
(or corresponding) angle with the 60 marked, so *j =* 180 – 60

•    It’s a supplementary angle with angle B so it’s 180 – 60

•    For the bottom trapezium, *j +* 100 + 80 + 60 = 360,
so *j =* 360 – 240

•    In the parallelogram, angles A and C are equal, so *j =* (360 – 60 – 60) *÷* 2

•    Angle C is supplementary with the 60º marked so is 180 – 60 = 120
*j* is the opposite angle in the parallelogram to angle C

***Accept minimally acceptable reason****eg*

*•*    *Alternate (or corresponding), on a straight line*

*•*    *Supplementary to 60*

*•*    *Quadrilateral 360 – 240*

*•*    *Parallelogram 240* ÷ *2*

*•*    *Parallelogram 180 – B*

***!***      ***For angle j, follow through****Accept as 200 – their h, alongside a correct reason referring to the quadrilateral containing both angles*

***Do not accept informal justification without correct
geometrical property identified****eg*

*•*    *180 – 60*

*•*    *360 – 240*

*•*    *240* ÷ *2*

*•*    *180 – B*

***Do not accept incomplete reason****eg*

*•*    *It is the same as angle C which is 120º*

*•*    *Angles in a quadrilateral add up to 360º*

*•*    *j and 60 are angles on a straight line so*     *add up to 180º*

**U1**

**[2]**

**Q7.**

115

**2**

***or***      Shows the value 230 or 130

          or

          Shows the value 90, provided there is no evidence
that this value has been assigned to angle *k*

          or

          Shows or implies a complete correct method with
not more than one computational error eg

•    

•    180 – 45 – 20

•    

or

          Forms a correct equation involving *k*, even
if the 90° angle has not been found

•    2*k =* 360 – 40 – *x*

•    (*k =*) 160 – *x*

**1**

**[2]**

**Q8.**

Shows angle *a* as 50

**1**

          Shows angle *b* as 130

***!***      ***For the second mark, follow through****Accept follow through as 180 – their a, provided their a < 90 and is not 54 to 56 inclusive*

**1**

          Shows angle *c* as 20

***!***      ***For the third mark, follow through****Accept follow through as 150 – their b
or their a – 30, provided this gives
a positive value*

**1**

**[3]**

**Q9.**

(a)     Gives the values 60, 60 and 60

***Accept: single answer of 60 given***

**1**

(b)     Gives the values 90, 45 and 45, in any order

**1**

**[2]**

**Q10.**

15, with no evidence of an incorrect method

***Do not accept incorrect method****eg*

*•*    *180 – 90 = 90*     *90 ÷ 2 = 45*     *45 ÷ 3 = 15*

**3**

***or***      Shows or implies at least two correct
deductions about *a* and *b*eg

•    2*a* + (180 – *b*) = 180, 3*b* + 90 = 180

•    2*a* = *b*, *b* = 30

•    *b* + 2*b* + 90 = 180, 2*a* + 2*b* + 90 = 180

•    *b* = 30, *a + b* = 45

•    2*a =* 180 – (180 – *b*), *a* + *a + 2b* = 90

•    2*a* = *b*, *a + b* = 45

•    (*a* =) 30 ÷ 2

*Note to markers:
From the three triangles, the following
simplified deductions may be made about
a and b
1.  2a = b
2.  b = 30
3.  a + b = 45*

          or

          Shows or implies a complete correct method
with not more than one computational error
eg

•    3 × *b* + 90 = 180, *b* = *25 (error)*180 – 25 = 155, 180 – 155 = 2 × *a,*so *a* = 25 ÷ 2
       = 12.5

**2**

***or***      Shows or implies at least one correct deduction
about *b* or about *a* and *b*

          eg

•    *b* = 2 × *a*

•    *b* = 30

•    (180 – 90) ÷ 3 = 30

•    2*b* + 2*a* = 180 – 90

***Accept b = 2a implied by values shown****eg*

*•*    *a as 22.5° and b as 45°*

**1**

(U1)

**[3]**

**Q11.**

Indicates No and gives a correct explanation

          eg

**•**    24 + 93 + 61 = 178 but it should equal 180 for a straight line

**•**    24 + 93 + 61 is 2 degrees too small for a straight line

**•**    4 + 3 + 1 = 8, so they couldn’t add to 180

***Accept: minimally acceptable explanation that states or implies the angles should add to 180 or that they add to less than 180***

*eg*

***•***    *The angles don’t make 180*

***•***    *They should add to 180*

***•***    *Too small by 2*

***•***    *The total ends in 8, but this should be 0*

***•***    *It totals 178°, so it would be an obtuse angle*

***Do not accept: incomplete or incorrect explanation***

*eg*

***•***    *24 + 93 + 61 = 178 which is not straight*

***•***    *The angles add to 188 not 180*

***•***    *The angles add to 178° so it will look straight*

**U1**

**[1]**

**Q12.**

(a)     50

**2**

***or***

          Calculates, or shows on the diagram, that the other acute angle in the
white triangle is 40

eg

•

              

•    180 – 60 = 120,
120 + 20 = 140,
180 – 140 = 40

*Do not accept 40 seen without being located on the* *diagram or without supporting working*

or

Shows a complete correct method with not more than one computational error

eg

•    180 – (20 + 120) *= 50 (error),*90 – 50 = 40

•    20 + 90 = 110,
110 *–* 60



•    180 ÷ 3 *=* 60*,*60 *–* 20 *= 50 (error)*180 – 90 *–* 50 *=* 40



**1**

(b)     Gives a correct justification

eg

•    DBE is 120 (180 – 60),
EBD is 30 (180 – 90 – 60),
so BDE is 30 (180 – 120 – 30)
As BDE = EBD then triangle BDE is isosceles

**2**

**or**

Shows working to justify that DBE is 30

eg

•    180 – (90 *+* 60) *=* 30

*Accept minimally acceptable justification*

*eg*

*•*    *Angle at B = 180 – 90 – 60 = 30, so the angles in the triangle are 120, 30, 30*

*Do not accept for 2 or 1, angle of 30 not justified, or justified only by assuming the triangle is isosceles*

*eg*

*•*    *The angles in triangle BDE are 30, 30 and 120*

*180 – 60 = 120, 180 – 120 = 60,
60 ÷ 2 = 30*

**1**

**[4]**

**Q13.**

(a)     Indicates 110

**1**

(b)     **For 2m** indicates 50

          **For only 1m** shows a complete, correct method, eg:

•    360 – 3 × 70 = 150, 150 ÷ 3

•    70 + *m* = 120

•    120 – 70

•    70 + 70 + 70 + *m + m + m* = 360

•    3 × 70 = 210, 150 + 210 = 360, 150 ÷ 3 = *60*

•    360 – 70 – 70 – 70 = 160, ÷ 3

**1**

**[3]**

**Q14.**

(a)     Indicates the correct angle, eg:

•    90

•    A right angle.

•    Right.

*Accept the reflex angle eg:*

*•*    *‘270°’*

*•*    *Three right angles.’*

*Accept angles in the range 87 to 93 inclusive.*

**1**

(b)     Indicates 6

*Accept any indication of the correct time, eg:*

*•*    *‘18’*

*•*    *‘Eighteen hundred’*

**1**

(c)     Indicates the correct angle, eg:

•    30

*Accept the reflex angle eg:*

*•*    *‘330°’*

*Angles in the range 27° to 33° inclusive.*

**1**

(d)     Indicates an angle in the range 147° to 153° inclusive, eg:

•    150

*Accept the reflex angle eg:*

*•*    *‘210°’*

***Allow follow through*** *from the previous part, provided this was not 0 and the answer to this part is a number between 0 and 360 inclusive. ie accept five times the previous response (minus a multiple of 360, where this is greater than 360).****or****Accept 360 minus five times the previous response (where this is less than 360).*

**1**

(e)     Indicates 1hour or 60 minutes, eg:

•    Hour.

•    60min

*Correct units must be given.*

**1**

**[5]**

**Q15.**

80

**2**

***or***      Shows a correct angle corresponding to a number of years other than 45
eg

•        8° is one year

•        40° is five years

•        15 years = 120°

•        Tom 160

          or

          Shows or implies a complete correct method with not more than one
computational or rounding error
eg

•        10 : 15 : 20  80 : 120 : 160

•         × 360

•        360 ÷ 9 × 2

•        0.22(…) × 360

•        Answer of 79 or a value between 79 and 80

*Do not accept for 1m, angle given without corresponding number of years*

**1**

**[2]**

**Q16.**

(a)     180 − 70 − 60

M1

50

A1

(b)     360 − 45 − 90 − 120

M1

105

A1

**Q17.**

(a)     360 − 134 − 85 − 46

*360 − 265*

M1

95

A1

(b)     Obtuse indicated

*Correct or ft answer from a*

A1ft

**Q18.**

An explanation showing an understanding:

•   that this specific triangle has angles 70, 70 and 40

**OR**

•   of the properties of an equilateral triangle − all angles are equal (60°)

and therefore that this triangle cannot be equilateral, e.g.

•   The angles aren’t 60°

•   There is not a 60° angle

•   It has two different angles (70° and 40°) so it can’t be equilateral

•   The angles aren’t the same

•   An equilateral triangle has 60° + 60° + 60°

•   All the angles are the same in an equilateral triangle

•   It’s an isosceles triangle.

(In the context of this question, the term isosceles triangle is treated as not including equilateral triangles as a special type, as the national curriculum does not specify this at key stage 2.)

***Do not*** *accept vague or incomplete explanations, e.g.*

*•   The other angle is 70°*

*•   They aren’t (all) the same. (No reference to angles)*

*•   An equilateral triangle has equal angles. (Does not say all.)*

***Do not*** *accept explanations which include incorrect mathematics or incorrect information that is relevant to the explanation, e.g.*

*•   40 + 70 = 110 + 70 = 180*

**[1]**

**Q19.**

540

**[1]**

**Q20.**

(a)     160

**1**

(b)     20

*If the answers to a and b are incorrect, award* ***ONE*** *mark if
a + b = 180° unless b is between 33° and 37° inclusive, or 90°.*

**1**

**[2]**