Answers to Sample 11+ Assessment Test for CEM (Durham University) Tests — Maths

Section A

1. D

There are 8 segments and 3 are shaded.
This is the fraction $\frac{3}{8}$.

2. 34 minutes

The range is the difference between the slowest time and the fastest time. The slowest time was 156 minutes and the fastest was 122 minutes.
156 – 122 = 34

3. B

You need to find the piece that is the right size and shape to fit in the gap. Shape B has been rotated by 180° but is the only shape that fits in the gap.

4. A

A small can of beans weighs around 250 g. All of the other weights are either too small or too large.

5. B

21^2 is 21 x 21. You can estimate the answer by rounding the numbers to the nearest 10 and working out 20 x 20.
20 x 20 = 400. The only realistic option is B: 441.

6. B

For B, the dial is split into 8 parts and 1 kg is at the 4th point, halfway round the scale. This means each point on the scale represents 1 kg ÷ 4 = 250 g.
As the arrow is pointing at the 3rd point, it is pointing at 3 x 250 g = 750 g.

7. 9 m

To find the length of 20 scarves you need to multiply 45 cm by 20: 45 x 20 = 900 cm.
There are 100 cm in 1 m, so 900 cm = 9 m

8. 145.75 cm

The difference between 145.6 and 145.9 is 145.9 – 145.6 = 0.3.
0.3 ÷ 2 = 0.15 so the halfway point between the two numbers will be 145.6 + 0.15 = 145.75

9. 6

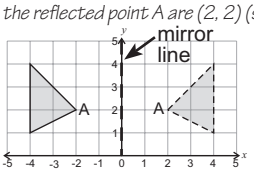
Dogs have $2\frac{1}{2}$ symbols and fish have 1 symbol so the difference between them is $1\frac{1}{2}$ symbols.
Each symbol in the pictogram is equal to 4 people.
So half of a symbol is 4 ÷ 2 = 2 people.
$1\frac{1}{2}$ symbols is equal to 4 people + 2 people
= 6 people

10. B

Elsa has 7 + 8 + 3 = 18 sweets to start with.
She eats 2 chocolates so there are 16 sweets left (18 – 2 = 16). There are still 8 toffees left, so the probability of picking a toffee next is $\frac{8}{16}$. Divide the numerator and denominator by 8 to find $\frac{8}{16} = \frac{1}{2}$.

11. E

The y-axis is the vertical axis so the coordinates of the reflected point A are (2, 2) (see the diagram).



12. £45

If you add up the portions that Eloise, Lucinda and Jennifer get all together, 5 + 3 + 2 = 10.
Calculate the amount in one share:
£150 ÷ 10 = £15
Eloise, Lucinda and Jennifer share the money in a 5 : 3 : 2 ratio. Lucinda receives a share of 3, and therefore gets 15 x 3 = £45

13. E

The number 26 is an even number, but it isn't a multiple of 3 or a multiple of 7, so it can't be placed in the sorting table.

14. C

When you rotate the clear pentagon by 180° it looks like this:



The only option where the clear pentagon looks like this is option C.

15. 72 minutes

Work out the length of time that the journey takes on each bus. On Bus A the journey takes
9:44 to 10: 44 = 60 minutes
plus 10:44 to 10:56 = 12 minutes.
60 + 12 = 72 minutes.
On Bus B the journey takes
11:39 to 12:39 = 60 minutes
plus 12:39 to 12:48 = 9 minutes.
60 + 9 = 69 minutes.
The journey on Bus A is longer, so the longest time is 72 minutes.

16. A

When you multiply two odd numbers together you always make an odd number. So 113 x 115 will give an odd number as the answer.

17. A

The mode is the most popular result. Silver, purple and blue were each chosen once, gold and green were each chosen twice but red was chosen three times, so red is the mode.

18. 9

Ester won 32 prizes altogether so subtract the number she won on the other days from 32 to find the number she won on Thursday:
32 – 5 – 8 – 4 – 6 = 9

19. D

Look at each statement and decide if it's true:
A: $\frac{3}{4} = \frac{75}{100}$, so $\frac{7}{100}$ isn't greater than $\frac{3}{4}$.
B: $\frac{7}{100} = 0.07$, so $\frac{7}{100}$ isn't greater than 0.65.
C: $\frac{7}{100} = 0.07$, so $\frac{7}{100}$ isn't greater than 0.09.
D: $\frac{3}{4} = 0.75$, so 0.65 is less than $\frac{3}{4}$.
E: 0.65 is greater than 0.09.

20. B

The cactus plants come in boxes of 12 and Lemone needs 60 plants so she needs 60 ÷ 12 = 5 boxes.
The cost of 5 boxes is shown in the expression as $5C$. She needs to add this to the cost of the stall, S, so the complete expression is $S + 5C$.

21. 2

The total angle around the point at the centre of the spinner is 360° and there are 8 sections, so the size of each section is 360° ÷ 8 = 45°.
360° – 45° = 315° so the arrow is being turned in an anti-clockwise direction through 7 segments (8 – 1 = 7) which will leave it pointing at number 2.

22. D

25 x 4 = 100, so it takes 4 days to run 100 miles.
The number of days to run 800 miles will be 4 x 8 = 32 days.
This leaves 74 miles left over. 25 x 3 = 75 so it'll take 3 days to complete the last 74 miles.
32 days + 3 days = 35 days

23. 6 cm²

You can work out the area of a rectangle by finding length x width.
So, the area of the flag is 6 x 4 = 24 cm^2.
The flag is split into 4 equal rectangles, so the area of the shaded rectangle is 24 ÷ 4 = 6 cm^2

24. D

46 is 23 doubled, so 46 x 14 is 23 x 14 doubled.
So 46 x 14 = 322 x 2 = 644
140 is 10 times larger than 14,
so 46 x 140 = 644 x 10 = 6440 sweets

25. 24

The probability of Penny picking a white sock from the drawer is $\frac{2}{3}$. This means $\frac{2}{3}$ of the socks are white. There are 36 socks in total, so the number of white socks is $\frac{2}{3}$ of 36.
$\frac{1}{3}$ of 36 = 36 ÷ 3 = 12
So $\frac{2}{3}$ of 36 is 2 x 12 = 24 socks

26. D

n is the number of the term. Test each formula by substituting different values for n.
E.g for option D: $n - (n + 1)$:
When n is 1: 1 – (1 + 1) = 1 – 2 = –1.
When n is 2: 2 – (2 + 1) = 2 – 3 = –1.
When n is 3: 3 – (3 + 1) = 3 – 4 = –1.
So $n - (n + 1)$ is the correct formula.

27. C

For Julie to have shared the carrots equally, whilst having none left over and not having to divide any, the number of rabbits must be a factor of the number of carrots, 70.
The only factor of 70 is 5 (70 ÷ 5 = 14).

28. D

Four squares north takes Adam to (–1, 2). Two squares east takes him to (1, 2).

29. D

$3(p + 6t)$ means:
$p + 6t + p + 6t + p + 6t = 3p + 18t$

30. 68%

To find a percentage you need to write an equivalent fraction over 100.
$\frac{16}{50}$ people had a blue car and when you multiply the numerator and denominator in $\frac{16}{50}$ by 2 you get $\frac{32}{100} = 32\%$.
The percentage of people who didn't have a blue car is 100% – 32% = 68%

Section B

1. C

Add the prices of the sets of three board games together. You need to find the option that adds up to £30.00 – £0.50 = £29.50.
This is easiest if you split the numbers and add the pounds and pence separately.
Blocks + Clueless + Trivia Time
= £12.50 + £6.50 + £10.50
= £12 + £6 + £10 + £0.50 + £0.50 + £0.50
= £28 + £1.50 = £29.50

2. £9.50

Two copies of Brainium cost £9.50 x 2 = £19.
Three copies of Trivia Time cost
£10.50 x 3 = £31.50
Together they cost £19 + £31.50 = £50.50.
Jill paid with 3 x £20 = £60. The change she received was £60 – £50.50 = £9.50

3. 50 cm²

The area of each square is length x width
= 4 x 4 = 16 cm^2.
The area of $\frac{1}{2}$ a square = 16 ÷ 2 = 8 cm^2.
1 whole square + 3 halves
= 16 + 8 + 8 + 8 = 40 cm^2
She uses 2 half circles so 1 circle in total.
The total area of the circle is 10 cm^2.
So, the total area is 40 + 10 = 50 cm^2

4. 4 m

The area of each tile is 0.04 m^2 and Moses uses 100 tiles to cover the floor, so the total area of the bathroom is 100 x 0.04 = 4 m^2.
The area of the bathroom is calculated using length x width, so area ÷ width = length:
4 ÷ 1 = 4 m

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5. 11:9

White tiles occupy 55% of the floor while black tiles cover 45%. Written as a ratio this is 55 : 45.
The highest common factor of 55 and 45 is 5.
Dividing both sides by 5 gives the ratio in its simplest form, 11 : 9.

6. 1.8 m²

The total area of the bathroom is 4 m².
10% of the overall area is 4 ÷ 10 = 0.4 m²
and 5% of the overall area is 0.4 ÷ 2 = 0.2 m².
Therefore 45% of the total area is
(0.4 × 4) + 0.2 = 1.6 + 0.2 = 1.8 m².

7. 120°

Each angle in an equilateral triangle is 60°.
The shaded angle is made up of the angles from two equilateral triangles so it is 60° + 60° = 120°

8. 12

In total, the girls have $H + (H + 2) + 2H$ handbags.
If they have 26 handbags altogether, this can be written as: $26 = H + (H + 2) + 2H$.
This is simplified to: $26 = 4H + 2$.
Subtract 2 from both sides: $24 = 4H$
So $H = 24 \div 4$, so $H = 6$.
Louise has $2H$ handbags.
2 × 6 = 12 handbags.

9. C

Amy has $H + 2$ handbags.
Georgina has 3 times this.
$(H + 2) + (H + 2) + (H + 2) = 3H + 6$

10. 91

£2.73 is made up evenly of 2p and 1p coins.
1p out of every 3p is a 1p coin, so $\frac{1}{3}$ of the money is made up from 1p coins.
£2.73 is 273p and $\frac{1}{3}$ of 273 is 273 ÷ 3 = 91.
So, 91 coins are 1p coins.

11. 30

	Girls	Boys	Total
Goals		4	
Saves	14	= (20 – 4) = 16	= (16 + 14) = **30**
Total	24	= (44 – 24) = 20	44

The table shows how to find the total number of saves. Start by working out the boys' total goals and saves (20). Then use this to find the number of the boys' saves (16). Add this to the girls' saves to find the total number of saves (30).

12. 5000

The length of each matchbox is 5 cm. This will fit along one side of the box 50 × 5 = 10 times.
The width of each matchbox is 2 cm. This will fit along one side of the box 50 × 2 = 25 times.
So one layer of matchboxes = 10 × 25 = 250 matchboxes.
The height of each matchbox is 1 cm, so the box is high enough to fit 20 ÷ 1 = 20 layers of matchboxes in it. So the total number of matchboxes = 20 × 250 = 5000

13. 125 000

In question 12, it was calculated that there were 5000 matchboxes in the packing box.
If there are 25 matches in each match box, there are 5000 × 25 matches in the packing box in total.
You can calculate this by finding 25 × 1000 × 5.
25 × 1000 = 25 000, 25 000 × 5 = 125 000.

14. £16

The cost of tickets for 2 adults and 2 children is £3.50 + £3.50 + £1.50 + £1.50 = £10
A family ticket is 20% cheaper — 10% of £10 is £1 so 20% is £2.
So a family ticket is £10 – £2 = £8
Raj is buying two family tickets so the total cost is £8 × 2 = £16

15. 5

The number of sausage rolls eaten by the children is 24 × 3 = 72 and the number eaten by the adults is 7 × 5 = 35. So the total number of sausage rolls eaten is 72 + 35 = 107.
The sausage rolls come in packets of 25.
4 × 25 = 100 so Sherrie will need to buy 5 packets to have 107 sausage rolls.

16. 4

There are 7 adults who eat $\frac{1}{7}$ of a cake each.
$7 \times \frac{1}{7} = 1$ cake
There are 24 children who eat $\frac{1}{8}$ of a cake each.
$24 \times \frac{1}{8} = 24 \div 8 = 3$ cakes
In total Sherrie needs 1 + 3 = 4 cakes

17. 10 years

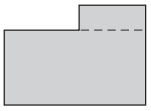
The plant needs to grow 0.5 m (2 – 1.5 = 0.5).
It grows 0.025 m in 6 months.
There are 12 months in a year so it will grow 0.025 × 2 = 0.05 m in a year.
0.5 m ÷ 0.05 m = 10, so it'll take the plant 10 years to grow 0.5 m.

18. 9 m

The vertical sides of the shape measure 1 + 6 + 7 = 14 m. So, the total of the horizontal sides of the shape is 32 – 14 = 18 m.
The bottom horizontal line is equal to the 2 top sides added together so the bottom horizontal line is half of the remaining perimeter.
The length of X (the bottom) is 18 ÷ 2 = 9 m.

19. 58 m²

Area of a rectangle = width × height.
The house can be split up into two rectangles.



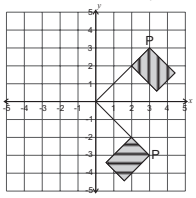
The bottom rectangle has an area of 6 × 9 = 54 m²
The upper rectangle has an area of 4 × 1 = 4 m²
The total area is 54 + 4 = 58 m²

20. 25%

The total amount of paint used by Harry is 3 + 4 + 5 = 12 litres.
3 litres of this was red paint, so the fraction of red paint used is $\frac{3}{12}$. $\frac{3}{12}$ is simplified to $\frac{1}{4}$ by dividing the numerator and denominator by 3, and $\frac{1}{4} = 25\%$ (25% × 4 = 100%).

21. D

The diagram shows the flag when it has been rotated clockwise by 90° about (0, 0).
The coordinates of point P are now (3, –3).



22. B

n is the number of the term. To find the first term, substitute 1 for n in the expression $3n^2 + 1$ (remember to follow BODMAS):
$3 \times 1^2 + 1 = 3 \times 1 + 1 = 3 + 1 = 4$
To find the second term, n is 2:
$3 \times 2^2 + 1 = 3 \times 4 + 1 = 12 + 1 = 13$

23. 12 cm³

The volume of each cube of cheese is 2 × 2 × 2 = 8 cm³.
There are 3 cubes of cheese, so the total volume of cheese is 8 × 3 = 24 cm³.
The mouse eats 12 cm³ of cheese, so the amount left is 24 – 12 = 12 cm³

24. D

The regular pentagon has 5 sides that are all $(2x - y)$ m.
$5(2x - y) = 2x - y + 2x - y + 2x - y + 2x - y + 2x - y = 10x - 5y$

25. 90 m

You can substitute the values $x = 10$ and $y = 2$ into the expression from question 24.
10 × 10 – 5 × 2 = 100 – 10 = 90 m
Alternatively, substitute the values of x and y into the expression for one side of the pen
2 × 10 – 2 = 20 – 2 = 18 m
There are 5 sides to the pen so the total perimeter is 18 × 5 = 90 m

26. 33

Brian needs 50 m² for every 3 sheep.
You need to work out how many lots of 50 m² there are in 555 m².
555 ÷ 50 = 11 remainder 5. For every 50 m² Brian can have 3 sheep. Since there are only 11 full lots of 50 m², Brian can fit 11 × 3 = 33 sheep in the pen. There is a remainder of 5 m² which is not big enough for one sheep.

27. 136°

A kite is a quadrilateral so the angles in a kite add up 360°. This means that the angle missing in the kite is 360° – 130° – 130° – 56° = 44°
Angles on a straight line add up to 180°, so angle a is 180° – 44° = 136°

28. C

Round up 49p to 50p and 29p to 30p to make the calculations easier. Carrie bought 4 chocolate bars so the approximate price of these is 4 × 50p = £2.
She bought 7 bags of peanuts so the approximate price of these is 7 × 30p = £2.10.
£2 + £2.10 = £4.10. You rounded each item up by 1p and there were 11 items in total (4 + 7 = 11) so subtract 11p to find the exact total cost:
£4.10 – 11p = £3.99

29. 8 hours

Start by making sure everything is in the same units — there were 2 litres of water, so change this to millilitres by multiplying by 1000: 2 × 1000 = 2000 ml. There are 5 holes each losing 50 ml each hour, so the amount of water being lost each hour is 5 × 50 = 250 ml. Divide the total volume of water (2000) by the amount being lost each hour (250) to find the number of hours it'll take to empty:
2000 ÷ 250 = 8 hours

30. 120 minutes

If one hole is stoppered then only 4 × 50 = 200 ml of water will be lost per hour.
2000 ÷ 200 = 10 hours.
This is 10 – 8 = 2 hours more than when all 5 holes are losing water. 2 hours is 60 × 2 = 120 minutes.

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