Multiple-choice section

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Question | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| Answer | D | B | C | A | C | D | C | B | D | A |

Question 1 [3.1]

D



Question 2 [3.6]

B

(5 – 6*b*)2

= 52 – 2 × 5 × 6*b* + (6*b*)2

= 25 – 60*b* + 36*b*2

= 36*b*2 – 60*b* + 25

Question 3 [3.5]

C

3(2*x* – 1) – 4(*x* – 7*m*)

= 6*x* – 3 – 4*x* + 28*m*

= 2*x* + 28*m* – 3

Question 4 [3.7]

A

3*p*2– 15*p* + 27*ap*3

= 3*p*(*p* – 5 + 9*ap*2)

= 3*p*(9*ap*2 + *p* – 5)

Question 5 [3.3]

C

Zeros before the first non-zero digit are not significant.

Zeros between non-zero digits are significant.

End zeros after the decimal point are significant.

Therefore there are 4 significant figures.

Question 6 [3.8]

D

2*k*2 – 10 + 3*ck*3 – 15*ck*

2(*k*2 – 5) + 3*ck*(*k*2 – 5)

(2 + 3*ck*)(*k*2 – 5)

(2 + 3*ck*)(*k* –)(*k* +)

Question 7 [3.1]

C

(2*yz*3)3 × (*yz*)4 ÷ (3*y*2*z*2)2

= 23*y*3*z*9 × *y*4*z*4 ÷ 32*y*4*z*4

= 

=

Question 8 [3.2]

B



Question 9 [3.4]

D



Question 10 [3.2]

A



Multiple-choice total marks: 10

Short answer section

Question 11 5 marks [3.5, 3.6, 3.7]

The expression *b*2 – 49 is an example of a difference of two squares. *h*2 + 2*mh* + *m*2 is an example of a perfect square because its first and last terms are squares and because the middle term is twice the product of the terms in the brackets. This rule can be used to expand and factorise algebraic expressions.

Question 12 2 marks [3.5, 3.7]

‘Factorise’ and ‘expand’ are opposite instructions. To factorise is to express something as a product of its factors (often using brackets). To expand means to multiply these factors (to remove the brackets by multiplying factors inside the brackets by the factors outside).

e.g. 4*x* + 10*xy*:

The common factor is 2*x*, so place it outside of a pair of brackets and place the other factors inside:   
2*x*(2 + 5*y*)

Expanding these brackets gives the original expression:   
2*x* × 2 + 2*x* × 5*y* = 4*x* + 10*xy*

Question 13 4 marks [3.1]

(a) -4*bgh* × -11*bg*2 = 44*b*2*g*3*h*

**(b)**



Question 14 8 marks [3.2]

|  |  |
| --- | --- |
| (a)  =  = | (b) (2*xy*2)3 × (*x*2*y*)5  = 23*x*3*y*6 × *x*10*y*5  = 8*x*13*y*11 |
| (c) 55 × 35  = (5 × 3)5  = 155 | (d) *q*7 ÷ *q*11  = *q*-4  = |

Question 15 3 marks [3.2]

|  |  |  |
| --- | --- | --- |
| (a) 100 = 1 | (b) 4*r*0  = 4 × 1  = 4 | (c) (13*s*)0  = 130*s*0  = 1 × 1  = 1 |

Question 16 6 marks [3.2]

|  |  |
| --- | --- |
| (a) | (b) |

Question 17 4 marks [3.3]

(a) 92 017 000 = 9.2017 × 107 (b) 3.2 × 104 = 32 000

(c) 5.62 × 10-5 (d) 0.000 010 809

Question 18 1 mark [3.3]

3.42 × 10-3 × 3.8 × 107 – 8.706 × 10-1

= 129 959

= 1.299 59 × 105

Question 19 3 marks [3.3]

(a) non-zero significant figures = 5; zero significant figures = 1

In total, there are 6 significant figures.

(b) non-zero significant figures = 1; zero significant figures = 0

In total, there is 1 significant figure.

**(c)** 1.400 × 101

Question 20 3 marks [3.4]

(a) 

*a* + 3*b* = *p*(*w* + *v*)

3*b* = *p*(*w* + *v*) – *a*

3*b* = *pw* + *pv* – *a*

*b* = 

(b) *b* = 

*b* = 

*b* = 13

Question 21 3 marks [3.4]

(a) *A* =  × (3 + 4) × 6 = 21 cm2

(b)



Substitute *A* = 21, *h* = 6, *b* = 4:



Question 22 5 marks [3.5]

(a) 5(*x* – 8*z*) = 5*x* – 40*z*

(b) -3*p*2(1 – 5*mp*) = -3*p*2 + 15*mp*3

**(c)** 2(*a* + 1) + 4(*a* + *b*)

= 2*a* + 2 + 4*a* + 4*b*

= 6*a* + 4*b* + 2

Question 23 4 marks [3.5]

(a) 2(*a* + 1) + 4(*a* + *b*)

= 2*a* + 2 + 4*a* + 4*b*

= 6*a* + 4*b* + 2

**(b)** 2(11 – *a*)(*a* + 3)

= 2(11*a* + 33 – *a*2 – 3*a*)

= 2(-*a*2 + 8*a* + 33)

= -2*a*2 + 16*a* + 66

Question 24 3 marks [3.5]

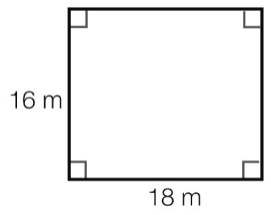
(a) *P* = 2 × 18 + 2 × 16

= 36 + 32

*P* = 68 m

*A* = 16 × 18

*A* = 288 m2



**(b)** *P* = 2(18 + *d*) + 2(16 + *d*)

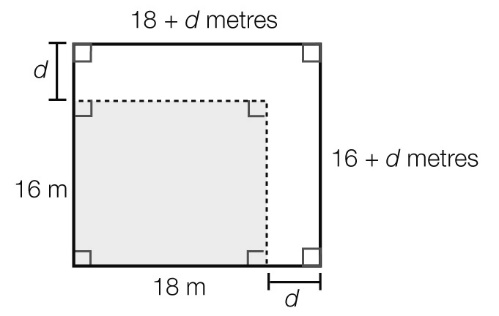
= 36 + 2*d* + 32 + 2*d*

= 68 + 4*d*

*A* = (16 + *d*) (18 + *d*)

= 288 + 16*d* + 18*d* + *d*2

= *d*2 + 34*d* + 288



Question 25 4 marks [3.6]

(a) (*b* + 2)2

= *b*2 + 2 × *b* × 2 + 22

= *b*2 + 4*b* + 4

(b) (3*n* – 4)2

= (3*n*)2 – 2 × 3*n* × 4 + 42

= 9*n*2 – 24*n* + 16

Question 26 3 marks [3.6]

(a) (*c* – *d*)(*c* + *d*) = *c*2 – *d*2

**(b)** (2*w*)2 – (3*q*)2 = 4*w*2 – 9*q*2

Question 27 4 marks [3.6]

|  |  |  |
| --- | --- | --- |
| (a) *A* = (*x* + 8)2  *A* = *x*2 + 2 × *x* × 8 + 82  *A* = *x*2 + 16*x* + 64 | **(b)** *P* = 4(*x* + 8)  *P* = 4(16 + 8)  *P* = 96 m | **(c)** *A* = (16 + 8)2  *A* = 242  *A* = 576 m2 |

Question 28 3 marks [3.7]

(a) 7*g*2*h* – 14*gh*2 = 7*gh*(*g* – 2*h*)

**(b)** 9*y*3 – 27*y*2*z* + 36*y* = 9*y*(*y*2 – 3*yz* + 4)

**(c)** *t*4 + 6*t*2 – 4*t*3

= *t*2(*t*2 + 6 – 4*t*)

= *t*2(*t*2 – 4*t* + 6)

Question 29 4 marks [3.8]

(a) *cd* + 4*d* + 7*c* + 28

= *d*(*c* + 4) + 7(*c* + 4)

= (*c* + 4)(*d* + 7)

**(b)** 5*x* + 15 – 2*xy* – 6*y*

= 5(*x* + 3) – 2*y*(*x* + 3)

= (*x* + 3)(5 – 2*y*)

Short answer total marks: 72

Extended answer section

Question 30 5 marks [3.3]

(a) 220 ÷ 1 000 000 = 0.000 22 m = 2.2 × 10-4 m

(b) 7.40 × 10-4 m = 0.000 74 m

0.000 74 × 1 000 000 = 740 µm

(c)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Amoeba | Micrometres (µm) | Metres (decimal) | Metres (scientific notation) | Millimetres |
| C | 300 | 0.0003 | 3.0 × 10-4 | 0.3 |
| D | 620 | 0.00062 | 6.2 × 10-4 | 0.62 |

(d) amoeba A = 0.22 mm

amoeba D – amoeba A = 0.62 – 0.22

= 0.4 mm

= 4 × 10-1 mm

Question 31 6 marks [3.4, 3.5]

(a) 120 = 2*x* + 2*y*

or 120 = 2(*x* + *y*)

(b) 2*x* + 2*y* = 120

2*y* = 120 – 2*x*

*y* = 

= 60 – *x*

(c) *A* = *x* × *y*

*A* = *x*(60 – *x*)

(d) *A* = 60*x* – *x*2

(e) *A* = 60 × 25 – 252

*A* = 875 cm2

*y* = 60 – 25

*y* = 35 cm

Extended answer total marks: 11

TOTAL test marks: 93