**Instructions**

**Expand and Factorise**

* Use **black** ink or ball-point pen.
	+ **Fill in the boxes** at the top of this page with your name,
	centre number and candidate number.
* Answer **all** questions.
* Answer the questions in the spaces provided
*– there may be more space than you need.*
* You must **show all your working.**
* Diagrams are **NOT** accurately drawn, unless otherwise indicated.
* If your calculator does not have a *π* button, take the value of *π* to be3.142

unless the question instructs otherwise.

**Information**

* The total mark for this paper is **58**. There are **20** questions.
* Questions have been arranged in an ascending order of mean difficulty, as found by all students in the June 2017–November 2019 examinations.
* The marks for **each** question are shown in brackets
*– use this as a guide as to how much time to spend on each question.*

**Advice**

* Read each question carefully before you start to answer it.
* Keep an eye on the time.
* Try to answer every question.
* Check your answers if you have time at the end.

**1** Expand and simplify 5( *p* + 3) – 2(1 – 2*p*)

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

(**Total for Question 1 is 2 marks**)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**2** (*a*)Expand and simplify (*x* + 5)(*x* – 9)

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

**(2)**

(*b*)Factorise fully 9*x*2 + 6*x*

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

**(2)**

**(Total for Question 2 is 4 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**3** Factorise *x*2 + 3*x* – 4

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

**(Total for Question 3 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**4** Factorise *x*2 − 2*x* − 35

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

 **(Total for Question 4 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**5** Show that (2*x* + 1)(*x* + 3)(3*x* + 7) can be written in the form *ax*3 + *bx*2 + *cx* + *d­*,

where *a*, *b*, *c* and *d* are integers.

 **(Total for Question 5 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**6** Show that (*x* + 1)(*x* + 2)(*x* + 3) can be written in the form *ax*3 + *bx*2 + *cx* + *d*

where *a*, *b*, *c* and *d* are positive integers.

**(Total for Question 6 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**7**  can be written in the form ** where *a* is an integer.

Find the value of *a*.

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

(**Total for Question 7 is 3 marks**)

**8** Expand and simplify (3*x* + 2)(2*x* + 1)(*x* − 5)

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

**(Total for Question 8 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**9** Expand and simplify (*x* + 2)(*x* + 8)(*x* – 4)

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

**(Total for Question 9 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**10** Simplify 

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

 **(Total for Question 10 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**11** Simplify fully 

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

(**Total for Question 11 is 3 marks**)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**12** (*a*)Factorise *a*2 − *b*2

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

(**1**)

(*b*)Hence, or otherwise, simplify fully (*x*2 + 4)2 – (*x*2 – 2)2

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

(**3**)

(**Total for Question 12 is 4 marks**)

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**13** (*a*)Expand and simplify (*x* – 2)(2*x* + 3)(*x* + 1)

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

**(3)**

**

(*b*)Find the value of *n*.

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

**(2)**

(*c*)Solve 5*x*2 – 4*x* – 3 = 0

Give your solutions correct to 3 significant figures.

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

**(3)**

**(Total for Question 13 is 8 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**14** Factorise (*x* + *y*)2 + 3(*x* + *y*)

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

**(1)**

**(Total for Question 14 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**15** Show that

(3*x* – 1)(*x* + 5)(4*x* – 3) = 12*x*3 + 47*x*2 – 62*x* + 15

for all values of *x*.

**(Total of Question 15 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**16** Martin expands (2*x +* 1)(2*x* − 3)(3*x +* 2)

He gets 12*x*3 − 4*x*2 − 17*x +* 6

(b)Explain why Martin’s solution cannot be correct.

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

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

**(1)**

**(Total for Question 16 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**17** Expand and simplify (*x* + 2)(2*x* – 3)(3*x* + 1)

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

**(3)**

 **(Total for Question 17 is 4 marks) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**18** Factorise 3(*x* − *y*)2 − 2(*x* − *y*)

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

**(2)**

**(Total for Question 18 is 2 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**



**19** (*a*)Simplify 

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

**(1)**

(*b*)Factorise fully 50 – 2*y*2

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

**(2)**

**(Total for Question 19 is 3 marks)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**20** Maryam is trying to expand and simplify (*n* – 2)2

Here is her working.

|  |  |
| --- | --- |
| (*n* – 2)2 | = (*n* – 2)(*n* – 2) |
|  | = *n*2 – 2*n* – 2*n* – 4 |
|  | = *n*2 – 4*n* – 4 |

Maryam’s answer is wrong.

(*a*) Find Maryam’s mistake.

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

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

**(1)**

Josh is trying to factorise *x*2 – 6*x* + 8

His reasoning is,

because 4 × 2 = 8

and 4 + 2 = 6

then *x*2 – 6*x* + 8 = (*x* + 4)(*x* + 2)

(*b*) Explain what is wrong with Josh’s reasoning.

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

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

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

**(1)**

**(Total for Question 20 is 4 marks) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**TOTAL MARKS FOR PAPER: 58**